projects, that can't be that hard. It may not be that easy, but it can't be that hard. Any Station 6 projects.

There is no point in scheduling the depositions until you see what those records are. So there is no point in trying to fit that in between now and the 10th.

MR. SACRIPANTI: I absolutely agree. It is an assumption -- the City is claiming damages for MTBE. They have an invoice, and they have proof that it has been paid. That is what I am looking for.

THE COURT: I understand what you want. They have to make a submission, some piece of paper that has to go to the water board or the water finance authority -- I don't know which -- and I guess that they cut a check or something back to the City?

MR. SACRIPANTI: Yes, ma'am.

THE COURT: And you are looking for that evidence?

MR. SACRIPANTI: Yes, ma'am.

THE COURT: I don't understand why that is all occurring in July, but that's the story.

I will issue an order making it that they be joined as party plaintiffs. I also find on the record that their joinder does not create any timeliness issues, but that any verdict therefore would bind the party plaintiffs and take care of any issue of a potential second bite of the apple, so to speak. They will be bound by the verdict.

EXHIBIT E

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

In Re: Methyl Tertiary Butyl Ether ("MTBE")
Products Liability Litigation

CITY OF NEW YORK, Plaintiff	
v.	**MDL NO. 1358** **Master File C.A. No.** **1:00-1898 (SAS)**
AMERADA HESS CORP., ET AL., Defendants	

Expert Report of Susan F. Tierney, Ph.D.

Susan F. Tierney, Ph. D.

March 24, 2009

1. Qualifications and Introduction

1.1. Qualifications

1. I am a Managing Principal at Analysis Group, Inc. ("Analysis Group"). I have been involved in issues related to public utilities and environmental quality for over 25 years as a regulator, policymaker, educator, and consultant. For approximately the past 14 years, I have been a consultant to private companies and governmental and other organizations on a variety of economic and policy issues in the public utility sector. Prior to joining Analysis Group in July 2003, I was employed as a consultant at Lexecon, Inc., and its predecessor company, the Economics Resource Group, Inc.

2. Before becoming an economic consultant, I served in senior state and federal policy and regulatory positions for 13 years. I was the Assistant Secretary for Policy at the U.S. Department of Energy from early 1993 through summer 1995, having been nominated by President Bill Clinton and confirmed by the U.S. Senate. Before that, I held senior positions in the Massachusetts State government as Secretary of Environmental Affairs (appointed by and serving under Governor William Weld, from early 1991 through early 1993); Commissioner of the Department of Public Utilities, now called the Massachusetts Department of Telecommunications and Energy, (appointed by and serving under Governor Michael Dukakis, from late 1988 through early 1991); Executive Director of the Energy Facilities Siting Council during the mid-1980s; and Senior Economist for the Executive Office of Energy Resources in the early 1980s.

3. In the past two years, I have served as co-lead of the transitions of two different Administrations in federal and state government: Most recently, I co-led the U.S. Department of Energy team for the Obama Presidential Transition Team, for four months before and after the Inaugural. Before that, I co-led the energy and environment team for the transition of Governor Deval Patrick in Massachusetts. I currently chair the Ocean Management Advisory Commission, established in Massachusetts to support a new law directing the State to develop an Ocean Management Plan.

4. As the Massachusetts Secretary of Environmental Affairs, I chaired the Board of Directors of the Massachusetts Water Resources Authority ("MWRA"), a publicly owned state corporation with bonding authority and rate-making autonomy for the provision of water and sewer services in the eastern part of Massachusetts. I served as the MWRA's board chairman at a time when MWRA's water and sewer rates were being raised significantly as part of its federal court-ordered compliance with national water quality and pollution control statutes and regulations. The Board met for a half day at least every other week. As Chairman of the Board during this particular period, I was actively involved in water utility strategy, in infrastructure investment decisions, and in setting rates for water and sewer service. During my tenure as Secretary of Environmental Affairs, matters relating to the MWRA represented some

of the most significant issues under my responsibility. These matters required my personal time and attention throughout my service as Board Chair.

5. I currently sit on several corporate and non-profit boards and commissions, including the National Commission on Energy Policy; the National Academy of Sciences' Committee on Enhancing the Robustness and Resilience of Electrical Transmission and Distribution in the United States to Terrorist Attack; and the Environmental Advisory Council of the New York Independent System Operator. Previously, I served as a director of the Electric Power Research Institute; as a member of the Advisory Council of the Independent System Operator – New England; as a representative to committees of the North American Electric Reliability Council; and as a member of the U.S. Secretary of Energy's Electric Reliability Task Force.

6. Prior to my work in state and federal government, I was an Assistant Professor at the University of California, Irvine. I hold a Ph.D. in regional planning from Cornell University (1980) and a Masters in Regional Planning, also from Cornell University (1976). My complete vita is attached as Appendix A.

7. From my jobs as a government regulator and policy maker and a consultant, I have extensive experience in economics and regulation, including expertise in utility planning and infrastructure investment, the rate-making review process, and compliance with federal and state pollution control programs.

1.2. Statement of Assignment

8. In this lawsuit, the City of New York has asked to recover from the Defendants all costs and damages that it alleges it "has incurred, is incurring, and will incur from investigating, cleaning, detecting, monitoring, preventing, abating, containing, removing, and remediating, among other things, the harm that"[1] MTBE has caused to the City's groundwater well system as a result of contamination of the soil and/or aquifer from which these wells draw water. The City alleges that "[r]emedying such harm has cost, is costing, and will cost the City a tremendous amount of resources that ultimately will affect the City's water policy for years to come."[2] The City of New York claims that the groundwater well system has been used and will continue to be used to provide drinking water to NYC residents.[3]

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[1] Fourth Amended Complaint, In re: Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation, *City of New York v. Amerada Hess Corporation et al.* Case No. 04-CV-3417 (SAS), US District Court Southern District of New York, p.2.
[2] Fourth Amended Complaint, In re: Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation, *City of New York v. Amerada Hess Corporation et al.* Case No. 04-CV-3417 (SAS), US District Court Southern District of New York, p.3.
[3] Fourth Amended Complaint, In re: Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation, *City of New York v. Amerada Hess Corporation et al.* Case No. 04-CV-3417 (SAS), US District Court Southern District of New York, p.25.

9. I have been asked by counsel for the Defendants in this proceeding to evaluate whether a decision to redevelop the Station 6 wells, which contain the five focus wells selected by the Plaintiff, for drinking water purposes would be consistent with prudent water utility management practices given the other options available to New York City and considering costs and benefits of pursuing these other options relative to the use of the wells in question. In addition, I have been asked to review the report of the Plaintiff's water treatment experts, Donald K. Cohen, CPG and Marnie A. Bell, P.E.,[4] and to evaluate their MTBE treatment cost estimates from an economic and policy perspective. I understand that there are five other focus wells with no apparent need for treatment at this time, and I reserve my right to opine on those at a later time.

10. A list of materials I have relied upon is attached as Appendix B. In preparing this report, I have relied upon certain expert opinions of Dr. David W. Hand,[5] Dr. Fletcher Driscoll,[6] and Mr. Glenn Thornhill.[7]

11. I respectfully reserve the right to respond to the opinions and testimony of the Plaintiff's experts. Moreover, I understand that these experts have not yet been deposed. I therefore reserve the right to amend my report if new information becomes available to me. The fact that I do not address certain opinions by the Plaintiff's experts should not be interpreted as an indication that I agree with those opinions.

12. As compensation for my preparation of this expert report, my firm is paid $655 an hour for my time. Part of the work for this investigation was performed by staff at Analysis Group working under my direction.

13. Based on my expertise, as described above, and my review of the materials and other expert reports listed in Appendix B, I have reached the following conclusions, which I discuss in the sections below.

2. Summary of Opinions

14. If a utility considers making substantial investments involving significant rate impacts on consumers, reasonable management practice would include analysis of relevant information, including benefits, costs, and risks. While generally important, this is particularly critical when a utility decides whether to pursue a policy or practice on a voluntary basis (such as to pursue a treatment objective for groundwater that goes well beyond government requirements for water quality.)

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[4] Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009.
[5] Expert Report of David W. Hand, Ph.D., March 9, 2009.
[6] Report of Fletcher G. Driscoll, Ph.D., March 9, 2009.
[7] Report of Glenn Thornhill, March 11, 2009.

15. In conducting a cost-benefit analysis, it is important to consider how the investment – in this case, the water supply – is to be used. If the objective of a water supply action is to provide flood control or a backup supply for emergency periods of short duration, then the costs and benefits would be different than those associated with the development of a continuously used, potable water supply.

16. In light of New York City's public service obligations as a provider of water and sewer utility services, its competing capital-investment needs for this purpose, and its inherently limited resources, its water utility agencies (i.e., NYW, the Water Board, and DEP) have a responsibility to make prudent investment decisions by considering the costs and benefits associated with investment alternatives.

17. Best management practices suggest that New York City focus on developing water resource options that maximize efficient use of its high-quality surface water supplies before investing in groundwater resources. Such options include more efficient supply management, more aggressive demand management, and increased reliance on integrated resource management.

18. Based on my experience and the documents that I have reviewed, there appear to be many supply options available to DEP that are preferable to reactivating the Station 6 wells. Therefore, I cannot conclude that it would be prudent for New York City to reactivate the Station 6 wells.

19. A proper study of the economic damages associated with any contamination arising from MTBE at the Station 6 wells (or other locations) should include: an incremental cost analysis; a reasonable treatment objective; an analysis of costs, benefits, and risks of investment alternatives; an analysis that reflects the time value of money; and an understanding that, for a utility required to cover its costs in rates charged to consumers, costs are not identical to economic damages.

20. Mr. Cohen and Ms. Bell's report is flawed because it fails to consider alternatives to reactivating the Station 6 wells, it does not use a reasonable treatment objective, it does not rely on an incremental cost analysis, it overstates the costs of treatment, and it does not appropriately discount the costs.

21. Based on Dr. Driscoll's prediction that MTBE concentration levels at all of the focus wells will be below detectable levels by 2016, Dr. Hand states that no treatment will be necessary, and no treatment costs will arise. However, Dr. Hand does present treatment cost estimates assuming treatment begins in 2009, although he recognizes that this scenario is unlikely. Dr. Hand's treatment cost estimates of $1.2 million for three years of treatment and $2.0 million for six years of treatment (assuming that treatment were to begin in 2009) are overly conservative, in that these figures are not discounted to 2009 dollars. Using Mr. Cohen and Ms. Bell's nominal discount rate, the discounted values for Dr. Hand's treatment cost estimates are $1.1 million for three years of treatment and $1.6 million for six years of treatment.

22. Based on my experience in utility regulation and governance, utility managers typically rely on sound engineering analysis, economic studies, and budget and financial analyses to evaluate investment decisions. Particularly when different technology options involve large capital and O&M expenses as well as complex trade-offs (e.g., in performance outcomes, sitting, and environmental impacts), utility managers would research all options and consider the costs and benefits.

23. In my experience, the type of analysis that Mr. Cohen and Ms. Bell provide would not be considered a reliable basis for decision-making were a utility to commit to the level of cost obligation implied by their opinions. This is particularly true, given that DEP appears to have multiple options to manage drinking water more efficiently to maximize the use of surface water.

3. Background Information

3.1. Governance Structure

24. The New York City Municipal Water Finance Authority ("NYW"), the New York City Water Board ("Water Board"), and the New York City Department of Environmental Protection ("DEP") are jointly responsible for New York City's water and wastewater system.[8] This system is the provider of public water and sewer utility service to customers in New York City.

25. The NYW is a public benefit corporation created in 1985 pursuant to the New York City Municipal Water Finance Authority Act.[9] The NYW's primary purpose is to finance the capital needs of the water and sewer system of New York City. NYW states that its "mission is to serve the citizens of the City by providing such financing in an efficient and cost-effective manner."[10] The NYW is administered by a board of directors, consisting of seven members, including the NYC Commissioner of Environmental Protection, the NY State Commissioner of Environmental Conservation, the NYC Director of Management and Budget, the NYC Commissioner of Finance, two public members appointed by the mayor, and one public member appointed by the governor.[11]

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[8] "The Official Home Page of the NYC Municipal Water Finance Authority," <http://www.nyc.gov/html/nyw/html/aboutus.html>, visited on March 19, 2009.
[9] "The Official Home Page of the NYC Municipal Water Finance Authority," <http://www.nyc.gov/html/nyw/html/aboutus.html>, visited on March 19, 2009.
[10] "Welcome to the NYC Municipal Water Finance Authority," <http://www.nyc.gov/html/nyw/home.html>, visited on March 19, 2009.
[11] "Laws of New York," <http://public.leginfo.state.ny.us/LAWSSEAF.cgi?QUERYTYPE=LAWS+&QUERYDAT>, visited on March 12, 2009.

26. The Water Board, which was created by the New York State legislature at the time of the creation of the NYW, has the primary authority to set rates for New York City's water and sewer services sufficient to pay the costs of operating and financing the systems that provide these utility services. Board members are appointed to two-year terms by the Mayor.[12]

27. DEP operates and manages New York City's water supply system and manages 14 in-City wastewater treatment plants and nine treatment plants upstate. Among other things, DEP "carries out federal Clean Water Act rules and regulations, handles hazardous materials emergencies and toxic site remediation, oversees asbestos monitoring and removal, enforces New York City's air and noise codes, bills and collects on almost one million water and sewer accounts, and manages Citywide water conservation programs."[13] Within DEP, the Bureau of Engineering Design and Construction is responsible for the "planning, design and construction of major water quality related capital projects."[14]

3.2. Service Area and Water Supplies

28. DEP provides water service in the five boroughs of New York City and many communities in Southeastern New York State.[15] According to the Water Board, "DEP supplies water to over eight million people in the Boroughs of the Bronx, Brooklyn, Manhattan, Queens and Staten Island, an area of over 300 square miles. The City is also required by State law to sell water to communities located in the eight counties where its water supply facilities are located. It currently provides water to approximately one million additional people in portions of four of the eight eligible counties – Westchester, Putnam, Ulster and Orange counties."[16]

29. DEP supplies approximately 1.1 billion gallons of drinking water daily.[17] According to DEP's 2007 Drinking Water Supply and Quality Report, more than 99.9 percent of

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[12] "The Official Home Page of the NYC Municipal Finance Water Authority," <http://www.nyc.gov/html/nyw/html/aboutus.html>, visited on March 19, 2009; The NYC Water Board Web Site, <http://www.nyc.gov/html/nycwaterboard/html/home/home.shtml>, visited on March 19, 2009.

[13] "Mayoral and City Agencies," <http://www.nyc.gov/portal/site/nycgov/menuitem.7cca96ad0a6ad5ed6bce0ed101c789a0/>, visited on March 19, 2009.

[14] New York City Department of Environmental Protection, "Bureaus and Offices," <http://www.nyc.gov/html/dep/html/about_dep/bureaus.shtml>, visited on March 24, 2009.

[15] City of New York Department of Environmental Protection, "Drought Management Plan and Rules", December 29, 1998, p. 1.

[16] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," p. 28. <http://www.nyc.gov/html/nycwaterboard/pdf/blue_book/bluebook_2009.pdf>, visited March 12, 2009.

[17] New York City 2007 Drinking Water Supply and Quality Report, p. 2.

the water came from its surface (reservoir) water supply systems, the Catskill/Delaware and Croton Systems, in 2007.[18]

30. In 2007, groundwater supplies accounted for "less than 0.1% of the City's total usage."[19] DEP's 2007 Drinking Water Supply and Quality Report states that "fewer than 100,000 people in southeastern Queens may receive groundwater or a blend of groundwater and surface water."[20] In 2007, the groundwater system only operated one well for two months of the year.[21] This pump was used intermittently depending upon the water demand of the service area.[22] According to an April 2008 information booklet, the groundwater system has not been operated since February 2007.[23]

31. There are several aquifers underlying Brooklyn and Queens Counties. The deepest aquifer in this area is the Lloyd's Aquifer; a middle layer is the Magothy Aquifer; and the shallowest aquifer is the Upper Glacial Aquifer.[24] Nassau and Suffolk Counties also draw water from these aquifers, but unlike New York City, they are heavily dependent on groundwater from these aquifers for their drinking water needs.[25]

3.3. Water Quality

32. New York City reports to its customers that its drinking water is safe and states that NYC tap water "is rated among the best in the country."[26] According to the U.S. Environmental Protection Agency, New York City tap water "is among the highest-

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[18] New York City 2007 Drinking Water Supply and Quality Report, p. 2. These systems include reservoirs and controlled lakes, which have a collective storage capacity of 558 billion gallons. City of New York Department of Environmental Protection, "Drought Management Plan and Rules", December 29, 1998, p. 1.

[19] New York City 2007 Drinking Water Supply and Quality Report, p. 2.

[20] New York City 2007 Drinking Water Supply and Quality Report, p. 2.

[21] New York City Department of Environmental Protection, "Groundwater System for 2007," <http://www.nyc.gov/html/dep/html/drinking_water/groundwater.shtml>, visited on March 9, 2009.

[22] New York City 2007 Drinking Water Supply and Quality Report, p. 8.

[23] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," April 2008, p. 28.

[24] Fourth Amended Complaint, In re: Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation, *City of New York v. Amerada Hess Corporation et al.* Case No. 04-CV-3417 (SAS), US District Court Southern District of New York, p. 23.

[25] Forman, Seth, Ph.D., "Long Island Regional Planning Board Draft Action Memo," Groundwater: Tapping the Lloyd Aquifer, July 2006, p. 1; New York City Department of Environmental Protection, "Groundwater System for 2007," <http://www.nyc.gov/html/dep/html/drinking_water/groundwater.shtml>, visited on March 9, 2009.

[26] New York City Water and Sewer System, "Comprehensive Annual Financial Report for the Fiscal Year July 1st 2007 – June 30th, 2008," p. 6.

quality and best-tasting water in the world."[27] As stated by Mr. Thornhill, "New York City's upper reservoir supplies, which provide a majority of the system's water today, are the only surface water supplies in the entire country exempted from Federal regulations that require all other reservoir waters to be filtered.… NYC's untreated reservoir water, as delivered to the city, has been recognized throughout the country as some of the best quality water anywhere. Its tap water has won awards, taste tests and is generally recognized throughout the water utility industry as a benchmark for quality and taste."[28]

33. According to the New York City 2007 Drinking Water Supply and Quality Report, groundwater supplies accounted for "less than 0.1% of the City's total usage." In 2007, "fewer than 100,000 people in southeastern Queens may receive groundwater or a blend of groundwater and surface water."[29] New York City's groundwater supplies are referred to as the "Jamaica Wells." As discussed in Mr. Thornhill's report, the groundwater lies beneath densely developed and populated areas. Furthermore, industrial facilities are prevalent in the area.[30] Mr. Cohen discusses in his deposition testimony the presence of iron, manganese and volatile organic compounds ("VOCs"), such as Tetrachloroethylene ("PCE" or "PERC"), and MTBE in the groundwater.[31]

34. DEP states that its water quality goals are to ensure that water from all of its water supply systems "is at all times protected against microbiological contamination, is aesthetically pleasing, and meets all drinking water quality standards."[32] DEP states:

> "In order to ensure that tap water is safe to drink, the New York State Department of Health (NYSDOH) and EPA prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. . . .Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk."[33]

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[27] New York City 2007 Drinking Water Supply and Quality Report, p. 1.
[28] Report of Glenn Thornhill, March 11, 2009, pp. 9-10. Footnotes in the original omitted here.
[29] New York City 2007 Drinking Water Supply and Quality Report, p. 2.
[30] Report of Glenn Thornhill, March 11, 2009, p.10.
[31] Deposition of Donald K. Cohen, January 13, 2009, pp. 173, 194-195, and 214 - 215.
[32] New York City 2007 Drinking Water Supply and Quality Report, p. 5.
[33] New York City 2007 Drinking Water Supply and Quality Report, p. 2.

35. There is no federal standard but only non-enforceable guidelines for MTBE.[34] New York State has a maximum contaminant level ("MCL") of 10 µg/L for MTBE.[35] The 2007 Drinking Water Supply and Quality Report, a document that DEP is required to prepare and mail to each customer, states that an MCL is the "highest level of a contaminant that is allowed in drinking water."[36] The Report particularly discusses PCE or PERC, lead, cryptosporidium, and giardia[37] and does not specifically discuss MTBE (except to say that it is not detected; MTBE is listed with other VOCs under the category of "Specific Organic Contaminants not detected").[38] 2004 - 2007 "Regulated Organic Contaminants" tables indicate that New York City has consistently met the New York State MCL of 10 µg/L for MTBE.[39] The 2007 Drinking Water Supply and Quality Report does not discuss a need to treat MTBE to a level below that New York State MCL, such as to a level of less than 3 µg/L.

36. The statements made by DEP in its 2007 Drinking Water Supply and Quality Report, some of which I quoted above, indicate that DEP represents to its customers that it is meeting state and federal water quality standards and is providing high quality water to its customers.[40]

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[34] United States Environmental Protection Agency, "MTBE (methyl-t-butyl ether) in Drinking Water," <http://www.epa.gov/safewater/contaminants/unregulated/mtbe.html>, visited on March 9, 2009; United States Environmental Protection Agency, "Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MtBE)," EPA-822-F-97-009, December 1997, pp. ii and 2, <http://www.epa.gov/waterscience/criteria/drinking/mtbe.html>, visited on September 24, 2007.

[35] New York State Register, "Rule Making Activities," December 24, 2003, p. 4. The 2007 Drinking Water Supply and Quality Report states an MCL is the "highest level of a contaminant that is allowed in drinking water." New York City 2007 Drinking Water Supply and Quality Report, p. 15.

[36] New York City 2007 Drinking Water Supply and Quality Report, p. 15.

[37] New York City 2007 Drinking Water Supply and Quality Report, pp. 8-11.

[38] New York City 2007 Drinking Water Supply and Quality Report, p. 14.

[39] New York City Department of Environmental Protection, 2004 – 2007 Regulated Organic Contaminants, <http://www.nyc.gov/html/dep/pdf/gws_od07.pdf>, <http://www.nyc.gov/html/dep/pdf/gws_od06.pdf>, <http://www.nyc.gov/html/dep/pdf/gws_od05.pdf>, <http://www.nyc.gov/html/dep/pdf/gws_odu04.pdf>, <http://www.nyc.gov/html/dep/pdf/gws_odt04.pdf>, visited on March 9, 2009.

[40] New York City Water and Sewer System, "Comprehensive Annual Financial Report for the Fiscal Year July 1st, 2007 – June 30th, 2008," p. 6; New York City 2007 Drinking Water Supply and Quality Report, p. 2.

3.4. History and Current State of the Jamaica Wells

37. The NYC Groundwater System was purchased from Jamaica Water Supply Company ("JWSC") in 1996.[41] Around the time New York City acquired these utility assets from JWSC, many of the wells that had belonged to JWSC were discovered to contain harmful chemical by-products. Some of the contamination stems from spills and storage tank leaks that resulted in the seepage of hazardous chemicals, including PERC, through the soil and into the groundwater. DEP explains the source of some of these contaminants in its 2007 Drinking Water Supply and Quality Report. The Report states, "The West Side Corporation…located at 107-10 180th Street in Jamaica, was a dry cleaning storage and distribution center that handled large amounts of the chemical tetrachloroethylene (also known as PERC or PCE) between 1969 and 1982."[42] As of 2007, DEP and the New York State Department of Environmental Conservation ("DEC") were working to "clean up both the soil and the groundwater contamination caused by the spills".[43]

38. The local community has expressed significant concern regarding the quality of the groundwater. According to Mr. William Yulinsky, the director of environmental health and safety with the Bureau of Waste Water Treatment, "The community ...has shown concerns in the past regarding the quality of the water, when it was owned by Jamaica Water Supply Company."[44] In a February 2002 letter from Mr. Cohen to Mr. Yulinsky, Mr. Cohen writes:

> "The community has a negative perception of the groundwater system, stemming back to the time when they received their water from the Jamaica Water Supply Company. Not only do they perceive the water quality as 'bad,' they also believe that there have been significant health impacts directly related to past consumption of the water."[45]

39. Station 6 has not been in use since 1985.[46] The remaining wells in the Jamaica system were "shut down for the most part in 1996."[47] DEP used five to seven of the Jamaica Wells in 2004 and 2005.[48] Well 5 was the only well online in 2006 and

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[41] Department of Environmental Protection, "Groundwater System for 2007," <http://www.nyc.gov/html/dep/html/drinking_water/groundwater.shtml>, visited on March 19, 2009.
[42] New York City 2007 Drinking Water Supply and Quality Report, p. 7.
[43] New York City 2007 Drinking Water Supply and Quality Report, p. 7.
[44] Deposition of William Yulinsky, March 14, 2007, p. 289.
[45] Letter from Cohen of Malcolm Pirnie to Yulinsky of DEP, dated February 15, 2002, p. 3.
[46] Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, p. 2-10.
[47] Schleifer, Stanley and Nazrul Khandaker, Natural Sciences Department, York College of CUNY, "Resuming Groundwater Withdrawal for Public Water Supply in Queens County, New York City," September 19, 2006.
[48] New York City Department of Environmental Protection, 2004 – 2005 Regulated Organic Contaminants, <http://www.nyc.gov/html/dep/pdf/gws_od05.pdf>,

2007, and it was used only intermittently. DEP states that Well 5 was used to "alleviate a localized pressure problem during peak periods," but it was removed from service in February 2007 due to a pump failure.[49]

40. Regarding the current condition of the wells, Dr. Driscoll states, "Most of the wells in the Jamaica well field are greater than 30 years old; the median age of the wells is 45 years old….Seven of the 13 wells considered to be 'serviceable' in 2008 have well screens that are more than 30 years old. Therefore, over half of the 'serviceable' wells may soon be reaching the end of their useful life."[50] Mr. Thornhill states, "After the JWSC wells were abandoned, they were allowed to deteriorate, without any maintenance or use, to the point where most of them would require major overhauls to bring them back into service."[51]

41. Despite the existence of known and potential future chemical contaminants and the deteriorating condition of the wells, DEP's 2007 Drinking Water Supply and Quality Report states that New York City was planning to build a new groundwater treatment plant to replace the existing treatment facility located at Station 6 in Jamaica, Queens. DEP states, "Once built, Station 6 will provide between 10 and 12 million gallons per day of drinking water. Construction will not commence before 2012."[52] Flood control is cited by DEP as a reason for activating Station 6.[53]

3.5. Water Management Challenges

42. The American Society of Civil Engineers ("ASCE") estimates that the United States needs to spend more than $2 trillion during the next five years to repair and replace aging infrastructure.[54] ASCE gave the nation's dams a grade of D, drinking water systems a grade of D-, levees a grade of D-, and wastewater treatment systems a grade of D-.[55] Many of the problems identified in the study pose serious public health, safety, and security concerns.

<http://www.nyc.gov/html/dep/pdf/gws_odu04.pdf>,
<http://www.nyc.gov/html/dep/pdf/gws_odt04.pdf>, visited on March 9, 2009.

[49] New York City Department of Environmental Protection, "Groundwater System for 2007," <http://www.nyc.gov/html/dep/html/drinking_water/groundwater.shtml>, visited on March 19, 2009; Report of Glenn Thornhill, March 11, 2009, p. 5.

[50] Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 10.

[51] Report of Glenn Thornhill, March 11, 2009, p. 11.

[52] New York City 2007 Drinking Water Supply and Quality Report, p. 6.

[53] "Brooklyn-Queens Aquifer Feasibility Study, Fact Sheet: Station 6 Modifications – November 2001;" DEP Groundwater Management Plan, Undated, Section 1.2, Flood Control and Other Secondary Benefits...

[54] In addition to water-related infrastructure, the ASCE study includes bridges, roads, railroads, schools, recreational facilities, and other infrastructure.

[55] American Society of Civil Engineers, "2009 Report Card for America's Infrastructure," http://www.asce.org/reportcard/2009/, visited on March 20, 2009.

43. New York State also has infrastructure problems and water management concerns. According to a report developed by the New York State Department of Health's Center for Environmental Health, "The conservative cost estimate of repairing, replacing, and updating New York's drinking water infrastructure is $38.7 billion over the next 20 years."[56]

44. One of New York City's biggest water management challenges is the need to inspect and repair its tunnels and reservoirs, some of which have been operating continuously since 1917.[57] The Dependability Program's report (prepared for New York City) states, "Many of its major components (tunnels, reservoirs) are aging and in need of maintenance."[58] The Dependability Program was implemented by DEP to analyze options to increase the reliability and sufficiency of New York City's water supply to meet demand during the period when the Rondout-West-Branch Tunnel is being repaired. New York City is considering redeveloping the Jamaica Wells for this purpose.

45. Repairing the Rondout-West-Branch Tunnel is not New York City's only water management challenge.

    - The Water Board notes that it must meet increasingly stringent water quality and public health regulations. An April 2008 information booklet states that DEP is implementing an "environmental mandate driven capital improvement program."[59]

    - DEP needs to solve persistent flooding and saltwater intrusion problems. According to DEP's Groundwater Management plan, "Fluctuation of the water table over time due to changes in groundwater extraction rates has led to extensive flooding of subsurface structures in both Brooklyn and Queens."[60] DEP's Groundwater Management Plan also mentions that there is a problem with "the movement of salt water into the fresh water aquifers."[61]

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[56] New York State Department of Health, "Drinking Water Infrastructure Needs of New York State," <http://www.health.state.ny.us/environmental/water/drinking/infrastructure_needs.htm>, visited on March 21, 2009.
[57] New York City 2007 Drinking Water Supply and Quality Report, p. 5-6.
[58] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, [NYC-DS-012512], p 1-1.
[59] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," p. 1. <http://www.nyc.gov/html/nycwaterboard/pdf/blue_book/bluebook_2009.pdf>, visited March 12, 2009.
[60] DEP Groundwater Management Plan, Undated, Section 1.2, Flood Control and Other Secondary Benefits.
[61] DEP Groundwater Management Plan, Undated, Section 1.0, Introduction & Plan Goals.

- DEP states that it needs to develop drought contingency plans. According to DEP's Drought Management Plan, it is necessary to have "contingency and emergency operations to supplement the water supply"[62] during times of drought. DEP also notes that it needs to promote water conservation.[63]

- DEP needs to protect against other supply emergencies. After the attacks of September 11, DEP has expressed the importance of increasing its Environmental Police Force activity and the heightened importance of "keeping the water supply and watershed safe and accessible."[64]

- DEP needs to address potential climate change impacts. According to a Keynote Address by then-DEP Commissioner, Christopher Ward, "[I]ncreases in precipitation and drought severity, i.e., instances of extreme weather conditions will be increasingly frequent and longer lasting."[65] These conditions can lead to "increased stormwater runoff and localized flooding; and negative water quality impacts."[66]

46. The funds available to address these many water management challenges are limited. In New York State, "the Drinking Water State Revolving Fund (DWSRF) was created by the federal and New York State governments to provide low interest loans and grants for water system improvement projects. Since that time, New York State has invested almost $2.4 billion in drinking water infrastructure through the DWSRF program. Despite this level of investment, approximately 95 percent of the projects submitted for inclusion in the DWSRF program remains unfunded due to a lack of available funds."[67]

47. In an April 2008 information booklet, the Water Board discusses the capital projects that it is prioritizing to try to address the challenges it faces. The Board's 2009 fiscal year rate proposal involves increasing water rates by 14.5 percent due to "[s]ystem operations and maintenance costs that are increasing, an environmental mandate driven capital improvement program that is large and revenue performance which is

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[62] City of New York Department of Environmental Protection, "Drought Management Plan and Rules," December 29, 1998, p. 1.
[63] City of New York Department of Environmental Protection, "Drought Management Plan and Rules," December 29, 1998, p. 1.
[64] "DEP Environmental Police Force Grows," *New York City Watershed Recreation*, Vol. 1, Spring 2003, <http://home2.nyc.gov/html/dep/html/watershed_protection/pdf/wsnewss03.pdf>, visited on March 15, 2009.
[65] DEP Commissioner Christopher Ward, New York Regional Energy/Water Workshop, Keynote Address, April 20, 2004, p. 5.
[66] DEP Commissioner Christopher Ward, New York Regional Energy/Water Workshop, Keynote Address, April 20, 2004, p. 5.
[67] New York State Department of Health, "Drinking Water Infrastructure Needs of New York State," <http://www.health.state.ny.us/environmental/water/drinking/infrastructure_needs.htm>, visited on March 20, 2009.

weaker than expected."[68] The Water and Wastewater Capital Improvement Program is designed to "provide adequate resources for DEP to meet its commitments mandated under the Safe Drinking Water Act, the Clean Water Act, and various consent orders."[69] Capital investments include $6 billion to ensure the integrity of the water pollution control plants, $2.2 billion to protect upstate watersheds, $1.8 billion to build an ultraviolet light disinfection facility for the Catskill and Delaware water supplies, $1.5 billion to decrease the amount of untreated sewage released into the harbor from combined sewage overflows, $662 million to build a filtration plant for the Croton Water System, and $599 million for dependability/alternative sources program.[70]

48. In light of New York City's public service obligations as a provider of water and sewer utility services to its citizens, its competing capital-investment needs for this purpose and its inherently limited resources, its water agencies (i.e., NYW, the Water Board, and DEP) have a responsibility to make prudent investment decisions by considering the costs and benefits associated with each investment alternative. For example, when considering investments to redevelop the Jamaica Wells, including Station 6, for drinking water purposes, New York City should prioritize its needs and meet them with the most reliable, high-quality, and cost-effective water management alternatives.

49. Before examining New York City's stated desire to redevelop the Jamaica Wells in more detail and in the context of this intrinsic need to make prudent utility management decisions, I discuss principles of utility best management practices that should be considered. As a former utility regulator and active board member of a major metropolitan water and sewer system, and as an expert on utility regulation and economics, I have direct experience in identifying best practices in a number of utility management areas.

4. Utility Best Management Practices

4.1. Conceptual Framework

50. Water utilities are charged to provide high-quality, reliable service while minimizing costs. Given their status as local monopolies providing an essential public service

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[68] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," April 2008, p. 1.
[69] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," April 2008, p. 3.
[70] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," April 2008, pp. 3 to 5. Note: Funding for the Station 6 plant might be included in the $599 million for Dependability/Alternative Sources Program, although it is not mentioned specifically. Page 17 of the document shows that funding for "Dependability"-related projects is relatively small in most years.

necessary to meet the needs of residents and businesses in the area, it is important to ensure that they follow best-management practices. Utility best management practice requires the operator to carry out the duties of the utility system in a sound and economical manner.

51. When a utility incurs operating and capital costs that are charged to and paid by its customers, those costs are "recovered." A publicly owned utility *must* recover its costs through rates, charges, fees, and other sources of revenue, and it cannot have "stranded" or "unrecovered" costs (short of dissolving the enterprise).

52. The Water Board is bound by agreement with NYW to establish and collect rates, fees and charges sufficient to cover the costs incur by NYW to finance projects for the benefit of the water and sewer utility system and its customers.[71] The Water Board website provides information that is consistent with this concept:

> "New York's water and sewer infrastructure is funded by revenue it collects through water and sewer rates. The New York City Water Board is responsible for setting these rates, and must ensure that they are able to fund the entirety of the water and sewer system's operating and capital needs. This includes salaries and benefits for more than 6,000 City employees, as well as major initiatives like the ongoing construction of Water Tunnel No. 3, the construction of a filtration plant for the City's Croton system and significant upgrades and repairs to treatment plants, sewers, and other water infrastructure, all of which enable the City to provide clean, safe water to New Yorkers for decades to come and ensure that the health of the City's waterways continues to improve."[72]

53. This principle of rate recovery is explained by the Water Board in an April 2008 information booklet and in the rate covenant section of NYW's financing agreement:

> "The Board must adopt rates which will satisfy the revenue requirements of the System….At its Annual Meeting in May, the Board adopts an Annual Budget based on the system expenses that have been certified to it and adopts a rate which will produce sufficient revenues to meet those expenses."[73]
>
> New York City is responsible for setting rates: "to provide for (i) the timely payment of the Principal Installments of and interest on all Bonds and the principal of and interest on any other indebtedness of the Authority payable from

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[71] Financing Agreement By and Among The City of New York, New York City Municipal Water Finance Authority and New York City Water Board, dated as of July 1, 1985. (See, in particular, Article VI.)

[72] "Welcome to the NYC Water Board Web Site,**"** <http://www.nyc.gov/html/nycwaterboard/html/home/home.shtml>, visited on March 20, 2009.

[73] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," April 2008, p. 25.

Revenues, (ii) the proper operation and maintenance of the System, (iii) all other payments required for the System not otherwise provided for and (iv) all other payments required pursuant to the Agreement and the Lease." [74]

54. NYW's Bond Resolution, in turn, assures holders of NYW bonds that their bonds will be repaid by actions of the Board to fix and collect rates and other charges "sufficient to, among other things, pay the costs of operating and maintaining the System and to pay the principal of and interest on the bonds, notes or other obligations of the Authority…."[75]

55. For investor-owned utilities whose rates are regulated by an independent regulatory agency, such as is the case in New York State for electric distribution, natural gas distribution, and water supply service provided by an investor-owned utility, the regulatory agency would only allow the utility to recover in rates those costs that are net beneficial to consumers. The regulatory agency would consider whether a utility has considered other possibilities that might supply a similar quality of service at a lower cost. For example, under standard cost-based utility regulation, if the utility were to put forward a rate proposal designed to recover costs for a water project that was more expensive than other available options, the regulator would evaluate whether the benefits of that action justified the costs. If the regulator determined that the action was not economical, the regulator would not allow the utility to impose the incremental costs of the proposal on its customers; the costs would instead be borne by the utility's shareholders.

56. Although New York City's water supply and wastewater treatment system is publicly owned and not regulated by New York's Public Service Commission, its ratemaking process and goals and objectives are comparable to those typically used by state regulators when reviewing rates of investor owned utilities and holding them to a prudency standard. New York City's Financing Agreement states: "The City hereby covenants that it shall, at all times: (a) in accordance with the advice and recommendations of the Consulting Engineer, operate the [New York City] System properly and in a sound and economical manner…"[76] Similarly, the Public Information Regarding Water and Wastewater Rates states, "The City Office of

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[74] Financing Agreement By and Among The City of New York, New York Municipal Water Finance Authority and New York City Water Board, Dated as of July 1, 1985.

[75] See also the New York City Municipal Water Finance Authority Water and Sewer System General Revenue Bond Resolution, Adopted November 14, 1985 and incorporating changes in supplemental resolutions thereafter ("Bond Resolution"); this resolution assures holders of NYW bonds that their bonds will be repaid by actions of the Board to fix and collect rates and other charges "sufficient to, among other things, pay the costs of operating and maintaining the System and to pay the principal of and interest on the bonds, notes or other obligations of the Authority…." Bond Resolution, p. 3.

[76] Financing Agreement By and Among The City of New York, New York City Municipal Water Finance Authority and New York City Water Board, dated as of July 1, 1985, quote from Section 6.3, "Operations and Maintenance," p. 19.

Management and Budget projects the Water and Wastewater Systems' operating and maintenance expenses and certifies the FY2009 amount to the Water Board based on the Mayor's Executive Budget. … The system's consulting engineer must certify that expenses are reasonable and appropriate … [and the] Board must hold a public hearing in each borough of New York City."[77]

57. If a utility considers making investments or expenditures that would entail relatively large financial commitments and significant rate impacts on consumers, reasonable management practice would include analysis of relevant information (e.g., benefits and costs and risks) before making a decision. While this is generally important, it is particularly important where a utility is deciding whether to pursue a policy or practice on a voluntary basis (e.g., adhering to a treatment objective for groundwater that goes well beyond government requirements when cheaper surface water supply sources are available) and where the implications of adopting that policy or practice would involve a large financial commitment; reasonable and prudent utility decision-making normally requires an analysis of the potential benefits and costs of taking the action.

58. Cost-effectiveness studies are used to compare whether an investment is economical (i.e., least cost) compared to other options. Cost-benefit studies are used to analyze whether an investment will produce net benefits. A comprehensive cost-benefit analysis of water supply investments and options would consider the benefits of a reliable water supply, the quality of water, the environmental effects, and any other relevant costs and benefits.

59. In conducting a cost-benefit analysis, it is important to consider how the investment – in this case, water supply – is to be used. For example, the water *quality* requirements for water supply that would be used for such purposes as flood control, industrial applications, or irrigation uses would typically be less stringent than those needed for drinking water. If the objective of a water supply action is to provide flood control or a backup supply for emergency periods of short duration, then the costs and benefits would be different than those associated with the development of a dedicated potable water supply source to be used on a continuous basis as part of the basic water supply system.

60. Mr. Thornhill's assessment of prudent utility managers is consistent with mine. He discusses factors that a prudent water utility manager would consider when comparing investment options. He states that "A water utility has the ultimate responsibility to provide its customers with: (1) the best water quality possible that meets all Federal and State standards; (2) at the lowest price possible; while (3) ensuring that bond holders are paid their contractual return on investment."[78]

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[77] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," p. 25.
[78] Report of Glenn Thornhill, March 11, 2009, p. 8.

4.2. Reducing Supply Shortage Risks through Supply and Demand Management and Collaboration with Neighboring Water Districts

61. Best management practices strongly suggest that New York City focus on developing water resource options that maximize efficient use of the utility's high-quality surface water supplies before investing in groundwater resources. Such options include more efficient supply management (e.g., repairing existing infrastructure to reduce leaks), more aggressive demand management (e.g., conservation programs and rate reforms), and reliance on integrated resource management (e.g., greater collaboration with neighboring water authorities). Examples are discussed below.

4.2.1. Supply Management

62. As discussed in Section 3.5, New York City is investing in infrastructure repair; however, it appears that more can be done. According to its Fiscal Year 2009 Consulting Engineer's Report, "NYCDEP performed leak detection surveys on approximately 57% of the City's water mains…They are currently below their target of 50 miles/year for water main replacement due to deferral of funds."[79]

63. By repairing its existing infrastructure, DEP may be able to avoid expensive new supply projects. According to a 2005 DEP report, the Delaware Aqueduct System's estimated leakage rate as between 35 million and 50 million gallons per day. This system provides approximately 55 percent of New York City's water supply.[80]

64. Other cities have increased their water supplies by fixing leaking infrastructure. For example, since 2003, San Diego Water Authority has received water rights to 77,700 acre-feet per year (25.3 billon gallons per year) from projects to upgrade the All-American and Coachella canals. "The projects will stop the loss of water that currently occurs through seepage, and that conserved water will go to the San Diego Water Authority."[81] This effort to fix existing infrastructure has enabled San Diego to receive significant water supplies through lower-cost conservation investments.

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[79] The New York City Municipal Water Finance Authority Fiscal Year 2009, Consulting Engineer's Report, Prepared by Metcalf & Eddy (now AECOM), March 2, 2009, p. 14.
[80] New York City Department of Environmental Protection, "Delaware Aqueduct System: Water Leak Detection and Repair Program," 2005.
[81] "San Diego County Water Authority unanimously approves historic Colorado River deal, Board of Directors chooses option to receive additional water from canal lining projects," September 25, 2003, < http://www.sdcwa.org/news/092503boardvotesOption2.phtml>, visited on March 19, 2009.

4.2.2. Demand Management

65. Demand-side management is another way to reduce the risk of a supply shortage. Demand-side management programs consist of planning, implementing, and monitoring activities to encourage water consumers to modify their level and pattern of water usage. From an economist's perspective, demand-side management programs increase the efficiency of water utilization and are thus beneficial for customers, utilities, and society as a whole. Such programs can provide a number of benefits: to consumers, by satisfying their demand and potentially reducing costs; to a water utility, by deferring the need for capital expenditure on water sources, lowering cost of service, and improving operating efficiency and flexibility; and to society, by reducing environmental degradation and conserving sources.

66. DEP has implemented some demand-side programs. DEP's current Water Conservation Program places emphasis on the use of water-saving technologies. DEP offers to install water-saving shower heads, water-savers for toilets, and faucet aerators in qualifying properties. DEP also actively encourages its customers to exploit the Water Board's Water Reuse Program under which the Board offers lower "water and wastewater rates for buildings that recycle much of their water and reuse it for toilet flushing, irrigation and make-up water for evaporative cooling towers.[82] DEP is also participating in "Fix a Leak Week," an EPA program sponsored by "Watersense."[83] In this program New York City residents are encouraged to improve efficiency by checking for and fixing leaks, "which waste an average of 11,000 gallons of water per home each year."[84] DEP also states, "More than 1 trillion gallons of water are wasted in U.S. homes each year from easy-to-fix leaks."[85] Water conservation programs implemented by DEP have resulted in a decrease in the water consumption and wastewater flow by approximately 23 percent since 1990.[86]

67. DEP is considering implementing additional conservation measures. The "Expanded Demand Reduction Programs" option, outlined in the Dependability Program, involves installing water conservation devices, such as water-saving residential and commercial toilets, commercial urinals, residential clothes washers, and weather-

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[82] DEP, "Ways to Save Water," <http://www.nyc.gov/html/dep/html/ways_to_save_water/index.shtml>, visited on March 15, 2009.
[83] Information about "Watersense" available at <http://www.epa.gov/watersense/water/benefits.htm>, visited on March 13, 2009.
[84] "Fix a Leak Week is March 16 to 20, 2009," <http://www.nyc.gov/html/dep/html/news/fix_a_leak_week.shtml>, visited on March 20, 2009.
[85] "Fix a Leak Week is March 16 to 20, 2009," <http://www.nyc.gov/html/dep/html/news/fix_a_leak_week.shtml>, visited on March 13, 2009.
[86] Lynch, Patrick, "Down the drain; Engineers fight water scarcity with water efficiency," Consulting-Specifying Engineer, October 1, 2008.

based landscape irrigation controllers.[87] The cost for the baseline Demand Reduction Programs is estimated to be $0.37/1,000 gallons, and the cost for the Expanded Demand Reduction Programs is estimated to be $1.42/1,000 gallons.[88] The baseline program cost is the lowest cost option among the projects analyzed in the study, and the expanded program cost is one of the lowest cost options.

68. DEP ranks demand-reduction projects highly because they offer a high degree of DEP control and do not pose any "serious concerns."[89] Unlike new water supply projects, the demand-reduction programs pose no environmental threats and do not require complex permitting. Furthermore, they may have positive environmental effects. For example, DEP states that conservation can reduce wastewater treatment flows and costs.[90] This benefit of conservation may become more important in the future because climate change may increase storm water runoff. Former DEP Commissioner Christopher Ward states, "Increased precipitation in the future can lead to increased flow to wastewater treatment plants in combined-sewer overflow areas and the increased frequency, duration and volume of CSO discharges; increased stormwater runoff and localized flooding; and negative water quality impacts during wet weather events."[91] In addition, water conservation programs can reduce the water system's energy use. Energy is relatively expensive in New York compared to other states,[92] and currently, the water system accounts for 12 percent of New York City's electricity use.[93]

69. New York City's water rates are relatively low. According to the New York City Water Board, "In absolute dollars and as a percentage of median income, current NYC charges for single-family residential customers rank in the lower half of the twenty-four large cities surveyed and are below the average of all of these cities."[94] Figure 1 shows annual water and wastewater charges for a selection of large cities

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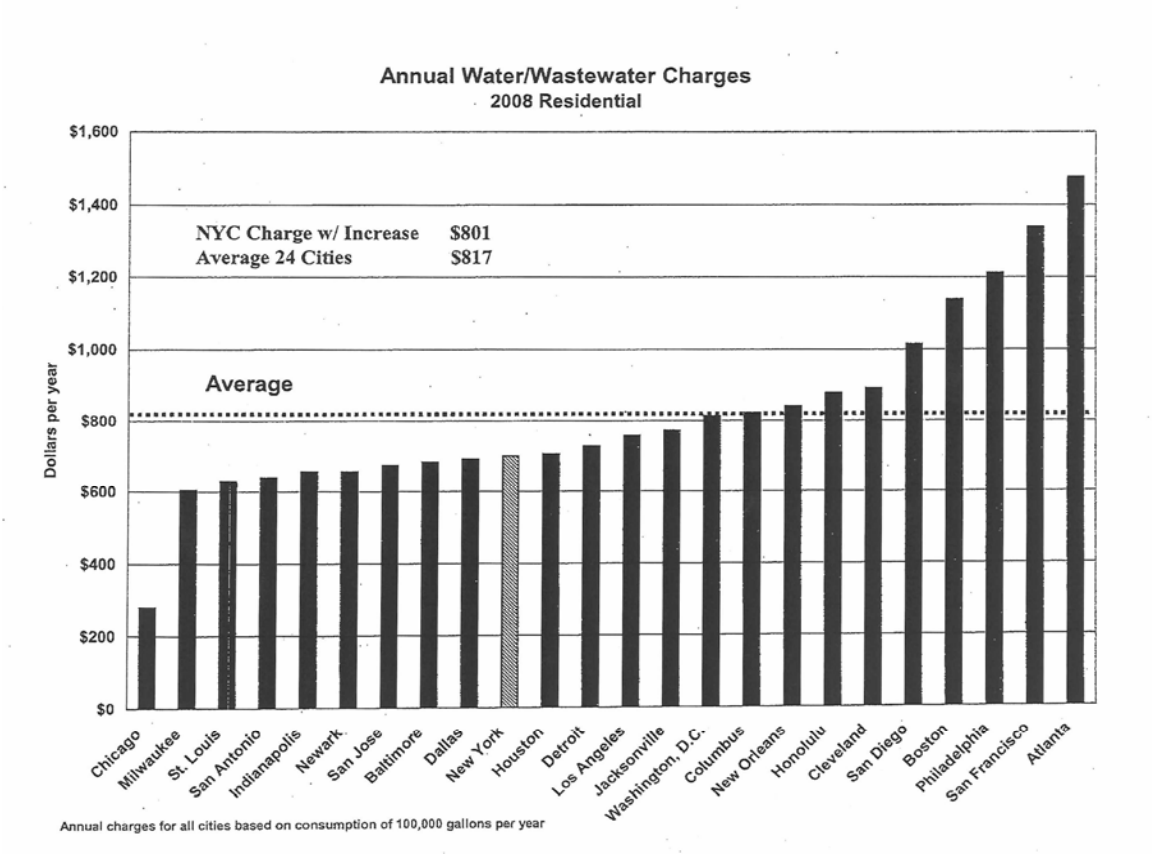
[87] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, [NYC-DS-012528].
[88] New York City Water Supply Dependability Program, November 2008 Draft, [NYC-DS-037009]; CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, [NYC-DS-012528].
[89] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, p. 5-1 [NYC-DS-012563].
[90] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, [NYC-DS-012528].
[91] New York Regional Energy/Water Workshop, DEP Commissioner Christopher Ward Keynote Address,Tuesday, April 20, 2004**,** p. 5.
[92] Energy Information Administration, Form EIA-826 Database Monthly Electric Utility Sales and Revenue Data, ftp://ftp.eia.doe.gov/pub/electricity/f8262008.xls, accessed March 20, 2009.
[93] New York Regional Energy/Water Workshop, DEP Commissioner Christopher Ward Keynote Address, Tuesday, April 20, 2004**,** p. 6.
[94] New York City Water Board, "Public Information Regarding Water and Wastewater Rates," April 2008, p. 2.

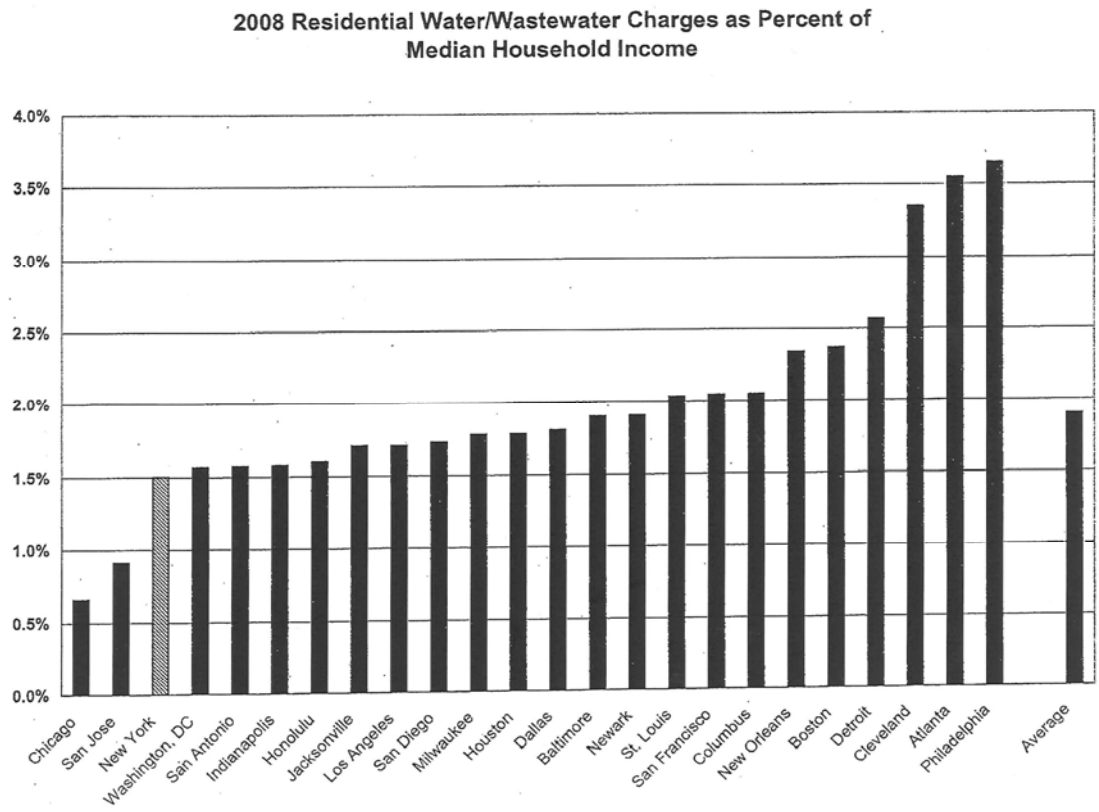
based on annual consumption of 100,000 gallons. Figure 2 presents the residential water rates as a percent of median household income. Figure 2 shows that New York City has the lowest water rate as a percent of household income after Chicago and San Jose.

Figure 1



Source: New York City Water Board, *Public Information Regarding Water and Wastewater Rates*, April 2008, p. 11.

Figure 2



Source: New York City Water Board, *Public Information Regarding Water and Wastewater Rates*, April 2008, p. 10.

70. Given the relatively high water consumption levels and low water rates relative to median incomes in New York City, there is potential to reduce water demand and increase efficiency through changes in rate design. Currently, New York City employs a flat fee (not volume dependent) for unmetered households. Flat fees do not provide an incentive to conserve or use utility service efficiently because price is not linked to the quantity consumed.

71. New York City employs a fixed volumetric rate for metered households. Tiered rates would allow customers to see the price of service at different levels of consumption, while enabling a utility to cover its costs (i.e., no more or less than the overall utility revenue requirement). In an increasing-block rate system, basic levels of service are priced at a lower rate and higher levels of consumption are priced at a higher rate. Increasing-block rate structures have been shown to increase efficiency. Rates that reflect the marginal cost of supply may signal to consumers that supplies are scarce and encourage them to conserve water.

72. DEP states that it has invested in increasing the accuracy of its water meters.[95] Given that it has already invested in metering and has indicated that it intends to continue this effort, DEP may have the ability to implement efficiency-promoting rate structures at a low incremental cost.

4.2.3. Integrated Resource Planning

73. In addition to improving its existing infrastructure and reducing demand through conservation programs and rate reforms, DEP might be able to improve reliability and increase efficiency through integrated resource management. This includes greater collaboration with neighboring water authorities.

74. In its Dependability Program, DEP prioritizes projects that provide a high level of DEP control. Groundwater projects rank highly largely due to this preference. DEP assigns a low rank to some projects identified in the Dependability Study that appear attractive because they require working with neighboring water districts. For example, building an interconnection with the Middlesex Water Company is the lowest cost option that DEP considers in the Dependability Program, after demand reduction programs. The Middlesex project, which would generate 50 percent more supply than the Station 6 Project, is the lowest cost option ($0.91/1000 gallons, and DEP states that this option has no significant concerns (in contrast with groundwater projects that DEP states have significant water quality and operational concerns); however, is only ranked 18 out of 26.[96]

75. DEP's preference for internal control may cause it to forgo projects that provide "economies of scale" and/or reliability at a lower cost. That is, collaboration might provide DEP with scale-based cost advantages, removing the need for it to invest in redundant, duplicative assets, especially those that are expected to be used infrequently and for emergency purposes. Collaborative projects can allow for efficient risk management. Pooling of risks between independent water districts may provide higher water supply reliability and reduce the probability that any particular water district would be exposed to specific, localized risks, e.g., mechanical failures, maintenance shutdowns, and localized contamination.

76. For example, the California Urban Water Agencies ("CUWA") predict that water agencies will increasingly rely on Integrated Regional Water Management Planning to promote water conservation and water supply reliability projects on a region-wide scale. Integrated Regional Water Management Planning is a water management approach that takes into consideration social, technical, environmental and economic issues. CUWA provides a forum for member agencies to "study and promote the

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[95] New York City 2007 Drinking Water Supply and Quality Report, p. 17.
[96] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, Tables 2-1 and 2-2 [NYC_DS_012520-2, NYC_DS_012525].

need for a reliable, high quality water supply for the state's current and future urban water needs."[97] CUWA states that its member agencies are implementing "aggressive water conservation programs to increase regional water supply reliability and to meet the demand of an increasing population in California."[98]

77. The Bay Area Water Supply & Conservation Agency ("BAWSCA") and the San Francisco Public Utilities Commission have partnered to improve regional water supply reliability by investing $2.9 billion in capital improvements to rebuild and retrofit the regional water supply system program.[99] The costs are being shared between the two agencies' customers. In addition, BAWSCA has implemented progressive conservation and water recycling programs to address water supply reliability.[100]

78. In Georgia, the state legislature has encouraged collaboration among water districts by passing laws that require a statewide water plan and regional planning district. Georgia Governor's office writes, "As Georgia's population continues to grow and the demands on water resources increase, Georgia requires a comprehensive plan, integrating all of its water management programs."[101]

79. These joint planning efforts are well known and prevalent in other utility industries. For example, for many decades the electric industry has carried out joint planning, interconnection and collaborative resource projects as a way to provide a given level of highly reliable service at lower cost. For many years, these joint-action efforts of utilities were carried out on a voluntary basis by utilities, through the North American Electric Reliability Council, and have been reinforced in federal law since 2005.

5. Analysis of the Reactivation of the Station 6 Wells

80. It is evident that New York City has many water management challenges and multiple options to address them. The path that New York City adopts has relevance to the issues before the court in this case.

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[97] California Urban Water Agencies, <http://www.cuwa.org/>, visited on March 23, 2009.
[98] California Urban Water Agencies, "Urban Water Conservation Accomplishments," December 2008, p. 1, <http://www.cuwa.org/library/cuwa_conservation_report.pdf>, visited on March 20, 2009.
[99] "Capital Improvement Program," <http://www.bawsca.org/improve.html>, visited on March 23, 2009.
[100] Bay Area Water Supply and Conservation Agency, <http://www.bawsca.org/index.html>, visited on March 20, 2009.
[101] "Governor Perdue Signs Bill Authorizing Statewide Water Plan," <http://gov.georgia.gov/00/press/detail/0,2668,78006749_92321069_92695678,00.htm>, visited on March 20, 2009.

81. One of the reasons expressed by New York City for reactivating the Jamaica Wells is to provide flood control. Dr. Driscoll states that "the Station 6 modeling work being done in early 2000 as the well designs and permit issues were contemplated was focused solely on lowering the water table to relieve flooding in the surrounding area."[102] Similarly, both the Brooklyn-Queens Aquifer Feasibility Study and the Groundwater Management Plan list flood control as one of the main objectives of reactivating the wells.[103]

82. Dr. Driscoll states that the Station 6 wells are not suitable for flood control due to the existence of better alternatives. Dr. Driscoll states that "even though designed for flood control, Station 6 wells will have a poor efficiency for that purpose. As even the City's consultant (MPI) noted in their modeling work, wells placed closer to just two of these targets would be more far more effective requiring a 50-percent lower pumping rate (Agnani, 2000)."[104]

83. DEP has contemplated reactivating the Station 6 wells for a number of years. According to a letter dated February 15, 2002 from Mr. Cohen to Mr. Yulinsky of DEP, Mr. Cohen mentions "Station 6 improvements and treatment plant design"[105] as well as the need to "gain local community support and approval, specifically for the Station 6 project."[106] DEP has also examined the reactivation the Station 6 wells for drinking water as part of its Dependability Program, which is designed to reduce risks associated with an emergency loss of supply and to provide supply augmentation during the period when it is repairing the Rondout-West Branch Tunnel.[107]

84. The February 2002 letter from Mr. Cohen to Mr. Yulinsky states that the reactivation of the Station 6 wells will include the "introduction of as much as 9 million gallons per day of groundwater into the Queens portion of the distribution system."[108] The Dependability Study estimates that the Station 6 wells will supply up to 10 mgd of groundwater beginning in 2019.[109] This amount is only 4.3 percent of the supply augmentation that DEP estimates that it will need during the period of the Rondout-West Branch Tunnel repairs.[110]

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[102] Expert Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 27.
[103] "Brooklyn-Queens Aquifer Feasibility Study, Fact Sheet: Station 6 Modifications – November 2001;" DEP Groundwater Management Plan, Undated, Section 1.2, Flood Control and Other Secondary Benefits.
[104] Expert Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 29.
[105] Letter from Cohen of Malcolm Pirnie to Yulinsky of DEP, dated February 15, 2002, p. 2.
[106] Letter from Cohen of Malcolm Pirnie to Yulinsky of DEP, dated February 15, 2002, p. 2.
[107] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, p. 1-4 [NYC_DS_012516].
[108] Letter from Cohen of Malcolm Pirnie to Yulinsky of DEP, dated February 15, 2002, p. 3.
[109] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, p. 1-2 [NYC_DS_012514].
[110] CDM and Hazen and Sawyer, "NYC Water System Dependability Program Conceptual Plan and Results of Evaluation," May 2008 Draft, p. 1-3, [NYC_DS_012515].

85. Even if DEP were to demonstrate convincingly that the project is attractive on an expected cost basis, there are other potential problems that could drive costs up considerably. The first concern regarding the Station 6 groundwater project is the generally poor quality of the shallow Upper Glacial aquifer from which four out of five of the Station 6 wells draw. The Groundwater Management Plan mentions the "degradation of groundwater quality, primarily seen as increasing concentrations of chloride and total dissolved solids attributable to salt water intrusion."[111] The City's Joint Venture Consultant also noticed the poor water quality in the Upper Glacial Aquifer and recommended that the City not use shallow wells, such as those at Station 6, as part of the Dependability Program.[112]

86. Dr. Driscoll writes that ". . . in 1987 and again in 1997, recommendations were made to abandon and seal the wells because of organic and inorganic contamination (MPI, 1987; NYCDEP, 1997). The 1997 recommendation included a description of the wells as 'contaminated beyond economical means of remediation.'"[113] As a result of these findings, Dr. Driscoll states, "No prudent water supplier would install water supply wells where existing and potential ongoing contamination is expected unless all other alternatives had been fully explored."[114] DEP states that one of its goals is to "ensure that [New York City] tap water is safe to drink."[115] DEP should maximize efficient use of its existing high-quality surface water resources before investing in groundwater resources. Furthermore, based on my understanding of Dr. Driscoll's analysis, DEP should evaluate options to tap into its deeper aquifers before resorting to the use of wells that draw from the shallow Upper Glacial Aquifer, which is more prone to contamination.

87. Legal battles resulting from public opposition to the use of groundwater and additional contamination that might be discovered in the future could lead to project delays and could drive up the cost of the Station 6 project and other groundwater projects under consideration. From this perspective, New York City's groundwater options appear to entail greater risk than the surface water supply augmentation options under consideration.

88. Operational complexity and energy costs associated with groundwater pumping and water treatment are additional concerns. The energy costs per gallon are likely much higher for this project than for the surface water options available to DEP, which are largely gravity-based systems.[116] DEP has not stated its assumptions with regard to energy costs in the Dependability Study, and thus I am unable to evaluate those

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[111] Malcolm Pirnie, Groundwater Management Plan (Draft), Undated, Section 3.1.2.
[112] Deposition of Mark Maimone, January 16, 2009, pp. 77-78. All of the Station 6 wells, except for well 6C, draw from the Upper Glacial Aquifer. See Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, Table 2-1.
[113] Expert Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 26.
[114] Expert Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 28.
[115] New York City 2007 Drinking Water Supply and Quality Report, p. 2.
[116] New York City 2007 Drinking Water Supply and Quality Report, p. 1.

assumptions. I do know, however, that New York City's electricity rates are among the highest in the country. I have also not seen evidence that DEP evaluated the sensitivity of its cost estimates to increases in energy costs. A related issue that could affect energy-related operating costs is future carbon regulations. If greenhouse gas emissions are regulated or taxed in the future, this will further drive up the cost of energy-intensive groundwater supply options.

89. The cost of the Station 6 project and other groundwater projects being considered could also be affected by problems related to saltwater intrusion and the generally poor condition and advanced age of the wells. According to the Groundwater Management Plan, the groundwater system where the Jamaica Wells are located has been considered unreliable since 1940s due to issues such as saltwater intrusion.[117] In 1974, the Woodhaven franchise of the New York Water Service Corporation (NYWSC), one of the two major water purveyors in Queens County, permanently ceased its pumping operation because of saltwater intrusion.[118] After City of New York purchased JWSC, these wells have never provided uninterrupted water supply and almost all wells have been shut down due to various reasons, including PCE contaminations and mechanical failure.[119] Furthermore, Dr. Driscoll stated that the median age of the Jamaica Wells is 45 years old.

90. I cannot conclude, based on my understanding of and experience in best practices in utility resource management, my review of the documents that have been made available to me, and the analysis of Dr. Driscoll and Mr. Thornhill, that a prudent water supplier would reactive the Station 6 wells.

6. Costs for MTBE Treatment

91. Mr. Cohen and Ms. Bell assume that Wells 6, 6A, 6B, 6D, and 33 will be redeveloped, and furthermore, they assume that the purpose of the redevelopment will be the continuous provision of drinking water to consumers. Even though New York City has considered other options to increase supply (e.g., in its Dependability Program), Mr. Cohen and Ms. Bell do not compare the costs and benefits of reactivating the wells to any other supply-side or demand-side alternative. As discussed above, given problems associated with reactivating the wells and the variety of other options available to DEP, I cannot conclude that their assumption is proper or consistent with prudent utility water management practice.

92. That said, for this portion of my report, I take as a given that a decision has been made to reactivate the Station 6 wells. Based on this assumption, I examine Mr. Cohen and Ms. Bell's cost estimates for treatment of MTBE to determine whether these cost estimates are valid. While Dr. Hand has evaluated Mr. Cohen and Ms.

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[117] Malcolm Pirnie, Groundwater Management Plan (Draft), Undated, Section 3.1.
[118] Malcolm Pirnie, Groundwater Management Plan (Draft), Undated, Section 3.1.
[119] New York City 2007 Drinking Water Quality Report, p. 7.

Bell's water treatment design and cost estimates from an engineering perspective, I consider their analysis from an economic and policy perspective.

93. In order to provide the context for my evaluation of Mr. Cohen and Ms. Bell's analysis, I explain some general economic and policy principles that should be considered when calculating any costs that might be attributable to treatment of MTBE.

6.1. Analysis of Incremental Effects

94. Economists often confront the general problem of how to measure the impact of a particular factor when there are many different factors that contribute to a total impact. Economic textbooks use the term "marginal analysis" or "incremental analysis" to refer to the process of measuring or isolating the effect of one factor when there are many factors that contribute to some overall effect. A standard approach that economists use to estimate incremental effects is called "but-for" analysis. In a "but-for" analysis, economists compare what can be observed in the real world to a hypothetical world in which a particular factor of interest is different. In the litigation context, this often means considering what the world would look like but for the alleged misconduct in the case. The difference in outcomes between the real world and the hypothetical world is the measure of the incremental effect of the alleged misconduct.

95. In applying this concept of incremental costs to the issues in this case, it is appropriate to examine what incremental costs arise as a result of MTBE. Doing so requires care to determine what costs New York City would incur, or would have incurred, even in the absence of MTBE. The costs that New York City incurred in the past or will have to incur in the future regardless of the presence of MTBE should not be attributed to MTBE. For example, if New York City would install a treatment system even in the absence of MTBE (because, for example, New York City needed to treat for other contaminants), then such capital costs would not be considered incremental and attributable to MTBE. As another example, if New York City would perform routine site visits to a well, even in the absence of MTBE, those site visit costs would not be incremental and attributable to MTBE, because they still occur even in the absence of MTBE. In this context, any costs that flow from a decision by New York City to reactivate and/or upgrade the poorly maintained groundwater system acquired from the JWSC for drinking water purposes that would be needed in that circumstance even in the absence of MTBE should not be attributed to MTBE.

6.2. The Need to Base Costs on Appropriate Treatment Objectives

6.2.1. US Environmental Protection Agency

96. In evaluating the economic implications of treating a water supply in the presence of environmental contamination, it is necessary to specify the relevant treatment

objective, i.e., the water quality standard or concentration level to which a contaminant is being treated. The federal Safe Drinking Water Act directs the US Environmental Protection Agency ("EPA") to regulate national drinking water standards. EPA sets National Primary Drinking Water Regulations ("Primary Regulations") that apply to public water systems. These Primary Regulations "protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in water. They take the form of Maximum Contaminant Levels [MCLs] or Treatment Techniques…."[120] EPA also establishes National Secondary Drinking Water Regulations ("Secondary Regulations"), which are non-enforceable guidelines for contaminants that may cause cosmetic effects (e.g., skin or tooth discoloration) or aesthetic effects (e.g., taste, color, and odor).[121] Public systems are not required to comply with these Secondary Regulations, though states may adopt them as legally enforceable standards.[122]

97. Although EPA has established Primary Regulations or Secondary Regulations for approximately 100 contaminants,[123] EPA has not established either a Primary Regulation or a Secondary Regulation for MTBE in drinking water.[124] In 1997, EPA published a drinking water advisory for MTBE. This advisory stated:

> "… keeping levels of contamination in the range of 20 to 40 μg/L or below to protect consumer acceptance [e.g., taste and odor] of the water resource would also provide a large margin of exposure (safety) from toxic effects… . Taste and odor values are presented as a range, since human responses vary depending upon the sensitivities of the particular individual and the site-specific water quality conditions. These values are provided as guidance recognizing that water suppliers determine the level of treatment required for aesthetics based upon the customers they serve and the particular site-specific water quality conditions."[125]

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[120] United States Environmental Protection Agency, Setting Standards for Safe Drinking Water, <http://www.epa.gov/safewater/standard/setting.html>, visited on March 20, 2009.
[121] United States Environmental Protection Agency, Setting Standards for Safe Drinking Water, <http://www.epa.gov/safewater/standard/setting.html>, visited on March 20, 2009.
[122] United States Environmental Protection Agency, Setting Standards for Safe Drinking Water, <http://www.epa.gov/safewater/standard/setting.html>, visited on March 20, 2009.
[123] United States Environmental Protection Agency, National Primary Drinking Water Standards, June, 2003, pp. 1-6, <http://www.epa.gov/safewater/contaminants/index.html>, visited on March 9, 2009.
[124] United States Environmental Protection Agency, MTBE (methyl-t-butyl ether) in Drinking Water, <http://www.epa.gov/safewater/contaminants/unregulated/mtbe.html>, visited on March 9, 2009.
[125] United States Environmental Protection Agency, Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MtBE), EPA-822-F-97-009, December 1997, p. ii and 2, <http://www.epa.gov/waterscience/criteria/drinking/mtbe.pdf>, visited on March 19, 2009.

98. EPA currently considers MTBE to be an unregulated contaminant with respect to drinking water.[126]

6.2.2. State Regulations

99. As of 2006 at least 12 states had established primary (health-based) drinking water standards for MTBE, ranging from 10 µg/L to 240 µg/L. In addition, at least seven states had established a secondary (taste and odor) drinking water standard, ranging from 5 µg/L to 40 µg/L (See Table 7).[127] In 2003, New York State finalized a rule establishing 10 µg/L as the MCL for MTBE for entities providing drinking water supplies in New York.[128]

[126] United States Environmental Protection Agency, MTBE (methyl-t-butyl ether) in Drinking Water, <http://www.epa.gov/safewater/contaminants/unregulated/mtbe.html>, visited on March 9, 2009.
[127] New England Interstate Water Pollution Control Commission, Final Report 2006 Survey of State Experiences with Petroleum and Hazardous Substance Releases at LUST Sites, Heating Oil Tanks, and Out of Service Tanks, Attachment 2, State Standard Summaries, 1-1a&b, December 2006.
[128] New York State Register, Rule Making Activities, December 24, 2003, p. 4.

Table 1
State Primary and Secondary Drinking Water Standards [A]

State	Primary Drinking Water Standard	Secondary Drinking Water Standard
California	13 µg/L	5 µg/L
Colorado		20 µg/L
Connecticut	70 µg/L	
Delaware	10 µg/L	
Illinois	70 µg/L	20 µg/L
Maine	35 µg/L	
Massachusetts		20 µg/L
Michigan	240 µg/L	40 µg/L
Montana	30 µg/L	
North Carolina	200 µg/L	
New Hampshire	13 µg/L	20 µg/L
New Jersey	70 µg/L	
New York	10 µg/L	
Texas	240 µg/L	15 µg/L

Notes:
[A] Source: New England Interstate Water Pollution Control Commission, "Final Report 2006 Survey of State Experiences with Petroleum and Hazardous Substance Releases at LUST Sites, Heating Oil Tanks, and Out of Service Tanks," Attachment 2, State Standard Summaries, 1-1a&b, December 2006.

6.2.3. Treatment Objectives

100. No federal MTBE standard exists, and the only legally enforceable MTBE standard that New York City must meet is New York State's MCL of 10 µg/L.[129] In its 2007 Annual Drinking Water Quality Report, DEP states that the MCL for MTBE is 10 µg/L,[130] and that an MCL is the "highest level of a contaminant that is allowed in drinking water."[131] Dr. Hand states:

> "Since Liquid phase GAC treatment is an unsteady state process and it is difficult to adjust the operational parameters, for GAC treatment, a treatment objective of 5 µg/L (half of the MCL), is both conservative and provides an adequate factor of safety. Air stripping is a steady state process and it is very easy to adjust the operational parameters, so a treatment objective just below the MCL is both reasonable and appropriate."[132]

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[129] New York State Register, Rule Making Activities, December 24, 2003, p. 4.
[130] 2007 Regulated Organic Contaminants, <http://www.nyc.gov/html/dep/pdf/gws_od07.pdf>, visited on March 16, 2009.
[131] New York City 2007 Drinking Water Supply and Quality Report, p. 15.
[132] Expert Report of David W. Hand, Ph.D., March 9, 2009, p. 6.

101. I have previously stated that governance and economic policy considerations support the use of a treatment objective no lower than 5μg/L.[133]

6.3. The Need to Adjust for the Time Value of Money (i.e., Present Value Analysis)

102. To value the costs and benefits of treating contamination occurring in multiple years, it is important to account for the time value of money. Intuitively, a dollar is worth more today than a dollar in the future. Cash can be invested to earn interest. If the rate of interest on U.S. government securities is 5 percent, then $100 invested today will be worth $105 the next year. Similarly, receiving $105 next year is equivalent to having $100 today. Thus, when evaluating projects with costs and benefits in future years, economists discount all future cash flows into consistent present value terms.

103. The net present value ("NPV") of an investment is the present value of its expected current and future cash flows where cash flows include benefits (positive) and costs (negative). The NPV can be negative (if the project overall results in a net cost) or positive (if there is a net benefit). The NPV concepts can also be effectively employed in a cost-effectiveness analysis that only assesses costs.

104. In a proper NPV calculation, the cash flows are discounted using an appropriate discount rate. The appropriate discount rate for an investment is the opportunity cost of capital for the contemplated investment; it accounts for the riskiness of the cash flows and the opportunity that exists for capital to be used for other purposes with different risks and returns than the particular investment at hand.

105. Discounting to reflect the opportunity cost of capital is different from correcting for inflation. Inflation reduces the purchasing power of money. The buying power of interest earnings is reduced by approximately the inflation rate. Analyses of future streams of benefits and costs must take inflation into account. However, even if cash flows have been corrected for inflation, those cash flows must still be discounted to reflect the opportunity cost of capital. It is important to distinguish between a nominal interest rate, which represents the growth rate of money, and a real interest rate, which represents the growth rate of purchasing power.[134]

106. Expected cash flows may be stated in nominal terms (i.e., not adjusted for inflation) or in real terms (i.e., adjusted for inflation). It is important that the expected cash flows and the discount rate are stated in consistent terms. That is, if

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[133] Expert Report of Susan F. Tierney, Ph.D., County of Suffolk and Suffolk County Water Authority v. Amerada Hess Corp., Et. Al., MDL NO. 1358, Master File C.A. No. 1:00-1898 (SAS), pp. 21-22.

[134] Bodie, Zvi, Alex Kane, and Alan Marcus, Investments, 6th Edition (McGraw-Hill Irwin, 2005), p. 138.

expected cash flows are stated in nominal dollars, a nominal discount rate should be used; if expected cash flows are stated in real dollar terms, a real discount rate should be used.[135] As a rule of thumb, the real interest rate is approximately equal to the nominal interest rate less the rate of inflation.[136] The choice of whether to use nominal or real discount rates and cash flows does not make a difference in the net present value.

6.4. Summary of Opinions on Conceptual Framework

107. From an economic perspective, economic damages arising from an event (such as a finding of harmful conduct in a legal proceeding) should reflect only incremental costs associated with that event. In other words, the only relevant costs are those that would not have been incurred "but-for" the harmful conduct. Any costs that flow from a decision by New York City to reactivate and/or upgrade the poorly maintained groundwater system acquired from JWSC for drinking water purposes that would be needed even in the absence of MTBE should not be attributed to MTBE.

108. The only legally enforceable MTBE standard that New York City must meet is New York State's MCL of 10 µg/L.[137] Governance and economic policy considerations support the use of a treatment objective no lower than 5µg/L.

109. If a utility considers making commitments that would entail relatively large financial implications and significant rate impacts on consumers, reasonable management practice would include analysis of relevant information (e.g., costs and benefits, and risks) before making an investment decision. Particularly where a utility is deciding whether to pursue a policy or practice on a voluntary basis (e.g., adhering to a treatment objective that goes well beyond government requirements) and where the implications of adopting that policy or practice would involve a large financial commitment, reasonable and prudent decision-making normally requires an analysis of the potential benefits and costs of taking the action.

110. To value the costs and benefits of treating contamination occurring in multiple years, it is important to adjust for inflation and to account for the time value of money by using appropriate discount rates.

111. Costs to a utility are not identical to economic damages to a utility. A utility company – whether publicly owned or investor-owned – is not the same entity as its customers. When a utility incurs Operations and Maintenance ("O&M") and capital costs that are charged to and paid by its customers, then those costs are "recovered" by the utility. A publicly owned utility *must* recover its costs through rates, charges,

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[135] Bodie, Zvi, Alex Kane, and Alan Marcus, Investments, 6th Edition (McGraw-Hill Irwin, 2005), pp. 138-139.
[136] (1+Real Discount Rate) = (1+Nominal Discount Rate)/(1+Inflation Rate).
[137] New York State Register, Rule Making Activities, December 24, 2003, p. 4.

fees, etc., and thus it cannot have "stranded" or "unrecovered" costs (short of dissolving the enterprise).

7. Critique of Cohen and Bell Report

112. Cohen and Bell's Report is flawed because it fails to consider other uses for Station 6 wells, does not rely on an incremental cost analysis, does not use a reasonable treatment objective, does not correctly reflect the time value of money, and overstates the costs of treatment.

7.1. Mr. Cohen and Ms. Bell Do Not Consider Other Uses for Station 6

113. Mr. Cohen and Ms. Bell assume continuous use of Station 6 wells to supply drinking water. However, according to DEP's Water Quality Report, the groundwater system is only for intermittent use and its pumping is based on the water demand of the service area.[138] In various documents, when DEP describes potential future drinking water uses of the Jamaica Wells, it is within the context of temporary or emergency supplies. For example, the Dependability Program states that the Station 6 Project "offers in-City supply source for use during emergencies outside of Dependability."[139] Mr. Cohen and Ms. Bell do not analyze how their results would change if the Station 6 wells were not used continuously or if the water were used for a purpose other than drinking water, such as flood control.

7.2. Mr. Cohen and Ms. Bell Do Not Perform an Incremental Cost Analysis

114. As discussed previously, contaminants present in the Station 6 wells include MTBE as well as many other chemicals. As part of on-going operations, there are a number of costs related to testing and treating many of these contaminants. Any costs associated with such testing and treatment that would occur even in the absence of MTBE should not be attributable to MTBE in an incremental, "but-for" analysis.

7.2.1. Incremental Costs of Capital Equipment

115. Based on recent concentration data, concentrations of both PCE and MTBE at Well 6D are above the New York State Department of Health ("NYSDOH") MCL.[140] If Well 6D requires immediate treatment, then according to Dr. Hand, "The cost of

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[138] New York City 2007 Drinking Water Supply and Quality Report, p. 8.
[139] New York City Water Supply Dependability Program Evaluation of Alternatives, Rondout-West Branch Tunnel November 2008 Draft, [NYC-DS-037012].
[140] Expert Report of David W. Hand, Ph. D., March 9, 2009, pp. 7-8; Expert Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, Figures 5-2 and 5-3.

treating of PCE will be factored into the cost of MTBE treatment because if MTBE was not present, well 6D would still have to be pumped; and capital, operation and maintenance costs would be realized for PCE."[141] PCE, like MTBE, can be treated with air stripping and GAC systems. Thus, it would be inaccurate to attribute the entire capital cost to MTBE. Dr. Hand accounts for this by assigning half the capital cost to each contaminant. Because both PCE and MTBE are present in the groundwater at levels above the MCL at Well 6D, Mr. Cohen and Ms. Bell should not have attributed all of the capital costs at Well 6D to MTBE.

116. According to Dr. Driscoll, none of the other Station 6 wells have MTBE concentrations above the MCL; however, PCE has been detected at concentrations exceeding the MCL at Wells 6, 6A, 6B, and 6D.[142] Thus, Mr. Cohen and Ms. Bell should not have attributed any capital costs to MTBE at the other wells.

117. Mr. Cohen and Ms. Bell also include replacement capital costs in year 41, the last year of their recommended treatment period. It is unclear why they recommend replacing the treatment system in the last year of treatment for MTBE. To the extent that New York City incurs costs for a replacement treatment system in year 41 due to contaminants other than MTBE, such costs should not be attributed to MTBE.

7.2.2. Incremental Operation and Maintenance Costs

118. Sampling and testing costs should be attributed to MTBE only if New York City would not incur such costs but for the presence of MTBE. Mr. William Yulinsky, director of environmental health and safety at the Bureau of Waste Water Treatment, testified during deposition that MTBE is tested with other VOCs.[143] If the Station 6 wells were restored for drinking water purposes, the water would need to be tested for the presence of the other VOCs regardless of the presence of MTBE. Incremental testing costs should be attributed to MTBE only to the extent that the presence of MTBE causes New York City to test more frequently.

119. Mr. Cohen and Ms. Bell attribute all testing costs to MTBE and do not consider that the drinking water must be tested for contamination related to other VOCs regardless of the presence of MTBE. From the point of view of estimating the incremental costs of testing attributable to MTBE, the costs should be limited to those tests over and above the tests that would occur in the absence of MTBE.

120. The water treatment costs that should be attributed to MTBE are only the costs that would not occur but for the presence of MTBE. Mr. Cohen and Ms. Bell do not

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[141] Expert Report of David W. Hand, Ph. D., March 9, 2009, p. 8.
[142] Expert Report of Dr. Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 33.
[143] Deposition of William Yulinsky, March 14, 2007, p. 269.

determine the incremental treatment costs attributable to MTBE and instead attribute all of treatment costs to MTBE.[144]

7.3. Mr. Cohen and Ms. Bell's Analysis is Driven by Their Use of Very Stringent Treatment Objectives

121. Mr. Cohen and Ms. Bell use treatment objectives for MTBE of 1 µg/L and 3 µg/L[145] and rely on Mr. Terry for concentration figures. Dr. Driscoll states, "Because Terry's modeling approach and implementation are seriously flawed, the costs estimated by Cohen and Bell are similarly invalid."[146] In addition, Mr. Cohen and Ms. Bell assume that MTBE treatment will be necessary for 40 years, or the year 2055, fifteen years beyond Mr. Terry's modeling period.[147] This is a direct contradiction to a 2007 Malcolm Pirnie report, which Ms. Bell was "involved in producing."[148] Relying upon the worst case scenario, the report concluded that "MTBE concentrations would require treatment for at most three years."[149] Mr. Cohen and Ms. Bell do not explain why their extended treatment period is necessary, and they do not explain why all the Station 6 wells would need to be treated for the same amount of time even though they may have different MTBE concentration levels and be otherwise dissimilar. Their use of treatment levels less than 5 µg/L, combined with their use of an arbitrary treatment period of 40 years, grossly inflates their cost estimates.

7.4. Mr. Cohen and Ms. Bell's Discounting Approach is Inconsistent with the Methodology they Specify

122. In their report, Mr. Cohen and Ms. Bell state that all capital and variable costs are in 2009 dollars.[150] Moreover, Mr. Cohen and Ms. Bell appear to have assumed that construction would occur in 2009 and O&M costs would begin in 2010.[151] However, elsewhere in their report, they note that construction would not begin until 2015 and operation until 2016. Thus, to calculate the NPV in 2009, the capital costs need to be

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[144] Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, p. 10-1.
[145] Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, pp. 9-10 and 9-11.
[146] Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 62.
[147] Expert Report of David B. Terry, P.G., February 6, 2009, p. 1; Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, p. 3-7.
[148] Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 61.
[149] Report of Fletcher G. Driscoll, Ph.D., March 9, 2009, p. 61.
[150] Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, p. 10-2.
[151] They take O&M costs in 2009 dollars, inflate them for just one year to arrive at the first year of O&M costs, and discount them by only one year to get a 2009 present value -- all of which implies that the first year of operation is 2010. This is inconsistent with the text, which describes a construction date of 2015 and an operation date of 2016.

inflated to 2015 dollars, the O&M costs need to be inflated to 2016 dollar values, and then all costs need to be discounted back to 2009 dollars. I correct these errors in Appendix C. The effect of properly discounting costs, using a real discount rate, is to reduce the NPV of treatment costs by approximately 9 percent. While Mr. Cohen and Ms. Bell conduct their analyses in nominal terms, using a nominal discount rate of 4.625 percent and an inflation rate of 3 percent, I have conducted my analyses in real terms. I use their nominal discount rate and inflation assumptions to calculate a real discount rate of 1.578 percent.[152] Accordingly, in my analysis, I have not inflated the costs because costs are expressed in real terms when a real discount rate is used. I replicate Mr. Cohen and Ms. Bell's analysis in Appendix D-3a using nominal terms and in Appendix D-3b using real terms to illustrate the two approaches yield identical results.

123. I emphasize that while I have corrected their discounting and replacement cost errors, as I discuss in Section 7.5 below, I have not made any other changes to their analysis. In any event, my presentation of these tables in Appendix C should not be interpreted to mean that I endorse these results.

7.5. Mr. Cohen and Ms. Bell Overestimate Design, Capital, and Operations and Maintenance Costs

124. Dr. Hand identifies flaws in Mr. Cohen and Ms. Bell's treatment design and capital costs. According to Dr. Hand, the size and cost of the air stripping and GAC vapor phase treatment system proposed by Mr. Cohen and Ms. Bell are "unwarranted and excessive."[153] To provide a "reasonable factor of safety," Mr. Cohen and Ms. Bell double the future MTBE concentration estimated by Mr. Terry to calculate the design maximum condition. For example, for Well 6D Mr. Terry projects that the maximum blended MTBE concentration between 2016 and 2040 will be 47 µg/L[154] while Mr. Cohen and Ms. Bell use concentrations of 70 µg/L and 95 µg/L.[155] According to Dr. Hand, this is "excessive because most packed air stripping towers build the factor of safety into the operational aspects of the design itself."[156] Dr. Hand states that redundancy, over-design, and use of expensive stainless steel materials have unnecessarily increased the capital costs for the air stripping and GAC vapor phase treatment by $45 million and for the liquid-phase GAC treatment by $54 million.[157]

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[152] (1+4.625%)/(1+3%) -1 = 1.578%
[153] Expert Report of David W. Hand, Ph. D., March 9, 2009, p. 10.
[154] Expert Report of David W. Hand, Ph. D., March 9, 2009, p. 11.
[155] Expert of Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, pp. 9-14 and 9-19.
[156] Expert Report of David W. Hand, Ph. D., March 9, 2009, p. 11.
[157] Expert Report of David W. Hand, Ph. D., March 9, 2009, pp. 13 and 16. These capital costs are related to the analyses of Alternatives 1A and 2A.

125. Dr. Hand believes that the design, capital, and O&M costs for the liquid-phase GAC treatment alternative are also excessive and highlights the improper design of the adsorber system, configuration of the GAC beds, and inaccurate GAC usage rates.[158] Dr. Hand states, "The operation and maintenance costs reported in the Cohen and Bell 2009 Report are… vastly overstated."[159]

126. Mr. Cohen and Ms. Bell's cost estimates are also overstated due to their assumption that Station 6 would be used continuously for drinking water purposes. Mr. Cohen and Ms. Bell ignore evidence that the Station 6 wells are intended for intermittent use and primarily for flood control as noted above. If the well were used for flood control, the discharge water would be subject to less stringent standards than drinking water. If the well water were used for emergency drinking water purposes, O&M costs would vary depending on whether the well is in service or on standby. Mr. Cohen and Ms. Bell do not consider the possibility that the wells will only be used intermittently, or primarily for flood control. This leads to an overstatement of costs.

127. Mr. Cohen and Ms. Bell also inflate their costs by including capital replacement costs in year 41 of treatment.[160] They base their cost estimates on a 40-year treatment period and year 41 is the last year of treatment. It is unclear why they would recommend replacing the water treatment equipment in the last year that they recommend treatment. If DEP were to begin installation of the new equipment in year 41, then, according to their assumptions, it would be available for use in year 42, which is outside their recommended treatment period. This assumption that the equipment should be replaced in year 41 increases Mr. Cohen and Ms. Bell's cost estimates by approximately 8 to 10 percent.

128. In addition to the replacement-cost error mentioned above, Mr. Cohen and Ms. Bell overestimate the replacement costs for GAC alternatives. In Appendix D of their report, the replacement cost estimates are assumed to be 20 percent of the total capital costs for GAC alternatives.[161] However, their calculations are inconsistent with those statements. Mr. Cohen and Ms. Bell use approximately 70 percent for GAC to estimate replacement costs. This assumption increases Mr. Cohen and Ms. Bell's cost estimates for GAC alternatives by approximately 8 to 9 percent.

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[158] Expert Report of David W. Hand, Ph. D., March 9, 2009, pp. 14-16.
[159] Expert Report of David W. Hand, Ph. D., March 9, 2009, p. 13.
[160] Expert Report of Donald K. Cohen, CPG and Marnie A. Bell, P.E., February 7, 2009, p. 10-5. For an example, also see Appendix D, pp. D-5 and D-6.
[161] Expert Report of Donald K. Cohen and Marnie A. Bell, February 7, 2009, Appendix D. For an example, see pp. D-5 and D-12. In Appendix D of their report, the replacement cost estimates assumed 50 percent of the total capital costs for air stripping. Mr. Cohen and Ms. Bell use approximately 45 percent of the total costs for air stripping.

7.6. Summary of Dr. Hand's Treatment Analysis, Assuming Treatment Begins in 2009

129. Based on Dr. Driscoll's prediction that MTBE concentration levels at all of the focus wells will be below detectable levels by 2016, Dr. Hand states that no treatment will be necessary, and no treatment costs will arise. However, Dr. Hand does present treatment cost estimates assuming treatment begins in 2009, although he recognizes that this scenario is unlikely. According to the 2007 Drinking Water Supply and Quality Report, construction of the new facility at Station 6 would not begin before at least 2012.[162] Furthermore, the Dependability Program provides an "implementation schedule" of 2019 for the Station 6 Project.[163]

130. Dr. Hand also estimates that if use and treatment of the wells were to begin in 2009, treatment would be necessary only at Well 6D and only for a total of 3 to 6 years. Based on his recommended treatment system design and operating procedures, Dr. Hand estimates that treatment costs will range from $1.2 million to $2.0 million.[164] Dr. Hand's estimates are conservative, in that he does not discount them to 2009 dollars. I believe this approach is overly conservative. I have restated his numbers to reflect the discount for the time value of money, and I use Mr. Cohen and Ms. Bell's implied real discount rate of 1.578 percent.[165] The discounted values for Dr. Hand's estimate of treatment costs for liquid-phase GAC (the lowest cost technology) are summarized in Table 2 below.

Table 2
Dr. Hand's MTBE Treatment Costs with 2009 Start Date
(Using Cohen/Bell Discount and Inflation Rates)

Alternative	Undiscounted [A] (000 USD)	Total NPV [B] (000 USD)
Treatment for 3 Years [C]	$1,160	$1,140
Treatment for 6 Years [D]	$1,953	$1,630

Notes:
[A] Source: Expert Report of David W. Hand, Ph.D., March 9, 2009, p.5. We understand that Dr. Hand has corrected his analysis, and we are using his corrected numbers.
[B] Source: Appendices D-1 and D-2. A real discount rate of 1.578 percent is used in the NPV calculation.
[C] Rate 650 GPM, Half-life 1 Year
[D] Rate 650 GPM, Half-life 2 Years

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[162] New York City 2007 Drinking Water Supply and Quality Report, p. 6.
[163] New York City Water Supply Dependability Program, November 2008 Draft, [NYC-DS-037012].
[164] Expert Report of David W. Hand, Ph. D., March 9, 2009, p. 5.
[165] I have also corrected some minor calculation errors in Dr. Hand's analysis, which make an immaterial difference (less than 0.5 percent) in his total cost estimates.

131. There is disagreement among experts as to the discount rate that should be applied to future streams of benefits and costs. The U.S. EPA recommends using a real discount rate of 2 to 3 percent. The Office of Management and Budget ("OMB") instructs analysts to "provide estimates of net benefits using both 3 percent and 7 percent" real discount rates.[166] In the Interest Rate Circular issued in December 2008, the OMB specifies a real discount rate of 2.7 percent for long-term projects.[167] The effective real interest rate in Mr. Cohen and Ms. Bell's analysis is 1.578 percent, which is lower than the rates recommended by EPA and OMB.

132. Dr. Hand's cost estimates are fairly insensitive to the choice of discount rate because the treatment period is short. Nonetheless, I show the effect of using a 2.7 percent real discount rate. Table 3 below shows the results.

Table 3
Sensitivity of Dr. Hand's MTBE Treatment Costs to Discount Rate

Alternative	Total Net Present Value (000 USD) [A]		Percentage Change
	Real Discount Rates [B]		
	1.578%	2.700%	
Treatment for 3 Years [C]	$1,140	$1,120	-1.75%
Treatment for 6 Years [D]	$1,630	$1,590	-2.45%

Notes:
[A] Source: Appendices D-1 and D-2.
[B] I calculated a real discount rate of 1.578% using Mr. Cohen & Ms. Bell's nominal discount rate of 4.625% and inflation rate of 3.0%.
[C] Rate 650 GPM, Half-life 1 Year
[D] Rate 650 GPM, Half-life 2 Years

7.7. Summary of Evaluation of Treatment Cost Estimates

133. In summary, based on my experience in utility regulation and governance, utility managers typically rely on sound engineering analysis, economic studies, and budget and financial analyses to evaluate investment decisions. Particularly when different technology options involve large capital and O&M expenses as well as complex trade-offs (e.g., in performance outcomes, siting, and environmental impacts), utility managers would research all options and consider the costs and benefits.

134. According to Dr. Hand, the analysis of Mr. Cohen and Ms. Bell is not based on sound engineering practices.[168] In my experience, the type of analysis that Mr. Cohen

[166] OMB Circular A-4, September 17, 2003, p. 34.
[167] OMB Circular A-94, "Appendix C Revised December 2008," <http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.aspx>, visited on March 23, 2009.
[168] Expert Report of David W. Hand, Ph.D., March 9, 2009, pp. 10-11.

and Ms. Bell provide would not be considered a reliable basis for decision-making were a utility to commit to the level of cost obligation suggested by their opinions. This is particularly true, given that DEP appears to have multiple options to manage drinking water more efficiently to maximize the use of surface water.

EXHIBIT F

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

IN RE:
Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation : MDL NO. 1358 (SAS)

In Re:
City of New York

CONFIDENTIAL (Per 2004 MDL 1358 Order)

January 23, 2009

Videotaped Deposition of VENETIA BARNES, P.E., held in the law offices of McDermott, Will & Emery, 340 Madison Avenue, New York, New York, beginning at approximately 10:02 a.m., before Ann V. Kaufmann, a Registered Professional Reporter, Certified Realtime Reporter, Approved Reporter of the U.S. District Court, and a Notary Public.

COPY

GOLKOW TECHNOLOGIES, INC.
877.370.3377 ph|917.591.5672 fax
deps@golkow.com

(Below-described document marked Barnes Exhibit 11.)

BY MR. CONDRON:

Q. Ms. Barnes, you have been handed what has been marked as Barnes Exhibit 11. For the record, it is a two-page document with Bates numbers NYC-DS-027371 through 7372. And it appears to be an e-mail chain. The first one appears to have been sent by you on or about -- on the page seems to have been sent by you on or around July 15 to a David Gaddis. Who is David Gaddis?

A. He is an employee of the CDM/Hazen and Sawyer dependability joint venture.

Q. Okay. And the CC on it is to Florence Mak. Who is Ms. Mak?

A. She works within my division.

Q. And what is her position in your division?

A. She is a project manager.

I report to her.

Q. And the re line is "ESR Update." What is ESR?

A. Executive summary report.

Q. For what purpose is the executive summary report prepared?

A. For my deputy commissioner.

Q. And who is that?

A. James Mueller.

Q. So this is a status report, if you will, submitted to him to tell him --

A. For dependability projects.

Q. Okay. Is Station 6 considered part of dependability?

A. It's the foreground on which dependability and groundwater will be based off.

Q. Looking through this, the first e-mail actually appears to have come from Mr. Gaddis to you. And he seems to have sent that, at least according to this, it appears, on July 10, 2008. And he indicates that he is

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

IN RE:
Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation : MDL NO. 1358(SAS)

CONFIDENTIAL (Per 2004 MDL 1358 Order)
In Re: City of New York

April 22, 2009

CONFIDENTIAL Videotaped Deposition of WILLIAM A.T. MEAKIN, P.E., held in the law offices of McDermott, Will & Emery, 340 Madison Avenue, New York, New York, beginning at approximately 10:13 a.m., before Ann V. Kaufmann, a Registered Professional Reporter, Certified Realtime Reporter, Approved Reporter of the U.S. District Court, and a Notary Public.

COPY

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deps@golkow.com

so I would be reporting to him, so yes.

Q. Fair enough.

With respect to the coordination between the DEP and the joint venture, is Mr. Cox the point person responsible for the day-to-day coordination with the joint venture?

A. Right now?

Q. Yes.

A. Presently? I would say the day-to-day work is Florence Mak.

Q. With respect to the Dependability Strategy, is there currently an approved design or plan to utilize wells or develop wells in Queens to alleviate flooding as it was discussed in the Groundwater Management Plan?

A. You're going to -- sorry.

Q. Sure.

A. Because you mentioned "design."

Q. I will go back and repeat it for you.

A. I probably mentioned all the CDM people and I've actually added a couple of other joint venture people.

Q. And with regard to Hazen and Sawyer, you mentioned Mr. Peters. Anyone else that you have spoken to at Hazen and Sawyer specifically to get an update to assist you in testifying here today?

A. Rick is a member of Hazen and Sawyer, I believe. Eileen Feldman, I believe, is Hazen and Sawyer. As I said, I know them as JV.

Q. Right.

A. I don't care which firm they work for. So, yes, I believe Ellen was in many progress meetings. Elaine? Ellen? Elaine. Sorry.

Q. In preparation to give testimony here today, did you speak to any City employees to assist you in getting information to testify?

A. Yes, I have.

Q. And who did you speak to?

A. I have talked to Joe Murin, sorry, Larry Delacruz, Kathryn Garcia.

Q. Anyone else you can think of?

A. I generally talked to my director, Jerry Cox, I have talked to Jerry about Dependability; my deputy commissioner, Jim Mueller; the acting -- assistant commissioner, Michael Borsykowsky are all involved -- are all people I report up to that I would have been talking to about Dependability and information would come out.

Q. Did you specifically speak to any of these people and say I'm going to have my deposition taken about the Dependability Project. I need some information about a certain aspect of it. What do you know about this?

A. Yes. Joe Murin, Larry Delacruz, Kathryn Garcia.

Q. And Mr. Murin, what division or bureau is he with?

A. He is our budget person for